

What is claimed:

1. A cellular phone providing wireless communication, comprising:

5 a main body having a key pad and a hinge thereof along a folding and unfolding axis;

a folder having a display displaying data received from the main body;

10 a driving source disposed on a lower portion of the folder along the folding and unfolding axis to generate a driving force;

a power transmission unit having one end coupled to the driving source and the other end coupled to the folder to transmit the driving force to folder to rotate with respect to the main body when the folder is in an open state; and

15 a rotation controller coupled to the power transmission unit, disposed in a housing installed at the hinge of the main body in a rotating axis perpendicular to the folding and unfolding axis to automatically and/or manually rotate the folder with respect to the main body.

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2. The cellular phone of claim 1, wherein the power transmission unit comprises:

a pair of bevel gears having a driving gear coupled to the driving source and a driven gear coupled to the driving gear and
25 having a shaft fixedly coupled to the folder.

3. The cellular phone of claim 2, wherein the power transmission unit further comprises:

a fixed member disposed on an outside surface of the shaft provided on the driven gear to couple the shaft to the folder.

4. The cellular phone of claim 3, wherein the fixed member
5 comprises:

a washer having a ring shape; and

a snap ring disposed on the washer to elastically press the washer.

10 5. The cellular phone of claim 3, wherein the shaft of the driven gear comprises:

a bearing disposed on the outside surface of the shaft of the driven gear contacting the folder to increase an rotation efficiency of the folder.

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6. The cellular phone of claim 1, wherein the rotation controller comprises:

a male cam having one end coupled to the power transmission unit and the other end formed with a projection with tapers on
20 both sides thereof;

a female cam having a groove corresponding to the projection to selectively receive the projection of the male cam to control the male cam; and

25 an elastic member disposed below the female cam opposite to the groove to elastically support the female cam to limit a movement of the female cam, and being compressed when the male cam rotates, to release the male cam from the female cam.

7. The cellular phone of claim 6, wherein the projection of the male cam comprises:

a center shaft extended from the male cam in a direction to the female cam to penetrate the female cam, the housing, and the
5 hinge of the main body to be rotatably fixed on an external side of the hinge.

8. The cellular phone of claim 6, wherein the female cam comprises:

10 at least one rotation preventing member formed on an outer surface of the female cam; and

a coupling groove formed on an inside surface of the housing to correspond to the rotation preventing to prevent the female cam from being rotated when the rotation preventing member is caught
15 the coupling groove.

9. The cellular phone of claim 1, wherein the main body and/or the folder comprise:

a folder state detecting unit detecting a folding and
20 unfolding state of the folder.

10. The cellular phone of claim 9, wherein the folder state detecting unit comprises:

a magnet provided on the folder; and

25 at least one hall element provided on the main body to detect a magnet field generating from the magnet to detect the folding and unfolding state of the folder.

11. The cellular phone of claim 1, wherein the rotation controller and/or the folder comprise:

a rotation stopping unit terminating a rotation of the folder when the folder is rotated at a predetermined rotation angle.

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12. The cellular phone of claim 11, wherein the rotation stopping unit comprises:

a lower protrusion protruding from a lower portion of the folder to rotate together with the folder; and

10 a stopper formed on the housing to correspond to the lower protrusion rotating together with the folder to control the folder to stop the rotation of the folder.

13. The cellular phone of claim 12, wherein the rotation
15 stopping unit further comprises:

a limit switch disposed adjacent to the stopper to terminate the rotation of the driving source so as to terminate the rotation of the folder.

20 14. The cellular phone of claim 1, wherein the folder and/or the power transmission unit comprises:

a rotation termination detecting unit detecting completion of the rotation of the folder to terminate the rotation of the driving source.

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15. The cellular phone of claim 14, wherein the rotation termination detecting unit comprises:

at least one fixed terminal disposed on the power

transmission unit; and

a rotation terminal disposed on the folder to correspond to the fixed terminal, and rotating together with the folder, and detecting the termination of the rotation of the folder when the rotation terminal correspond to the fixed terminal.

16. The cellular phone of claim 15, wherein the fixed terminal comprises:

first and second sub-fixed terminals disposed around the power transmission unit to be spaced-apart at an interval of 180°.

17. The cellular phone of claim 15, wherein the fixed terminal comprises a magnet, and the rotation terminal comprises a hall element to detect a magnetic field generating from the magnet to detect the completion of the rotation of the folder.

18. An automatic folder folding method used with a cellular phone providing wireless telecommunication, the method comprising:

inputting a rotation signal to a motor to rotate a folder with respect to a main body;

determining whether the folder is in an open or close state to rotate the folder according to the rotation signal;

determining whether a display of the folder is in an initial or opposite position when the folder is in the open state;

driving the motor in one of a forward direction and a reverse direction to rotate the folder according to a rotation direction determined by the initial position of the folder;

completing a rotation of the folder by a predetermined

rotation angle; and

cutting off the rotation signal from the motor to terminate the rotation of the folder.

5 19. The method of claim 18, wherein the determining of the open state of the folder comprises:

opening the folder when the folder is not in the open state.

10 20. The method of claim 18, wherein the driving of the motor comprises:

driving the motor in the forward direction when the display is in the initial position.

15 21. The method of claim 18, wherein the driving of the motor comprises:

driving the motor in the reverse direction when the display is in the opposite position.

20 22. An automatic folder folding method used with a cellular phone providing wireless telecommunication, the method comprising:

inputting a rotation signal to a motor to rotate a folder with respect to a main body;

25 determining whether the folder is in an open state to rotate the folder according to the rotation signal;

determining whether a display of the folder is in an initial or opposite position when the folder is in the open state;

driving the motor in one of a forward direction and a reverse

direction to rotate the folder according to a rotation direction determined by the initial position of the folder;

determining whether a rotation completion detecting sensor is in an on state to detect a rotation of the folder according to completion of the rotation of the folder by the motor; and

cutting off the rotation signal from the motor to terminate the rotation of the folder upon determining that the rotation completion detecting sensor is in the on state.

23. The method of claim 22, wherein the determining of the open state of the folder comprises:

opening the folder when the folder is not in the open state.

24. The method of claim 22, wherein the driving of the motor comprises:

driving the motor in the forward direction when the display is in the initial position.

25. The method of claim 22, wherein the driving of the motor comprises:

driving the motor in the reverse direction when the display is in the opposite position.

26. A cellular phone providing wireless communication, comprising:

a main body having a key pad and a hinge thereof in a folding and unfolding axis;

a folder having a display displaying data received from the

main body;

a rotation unit having one end coupled to the folder and the other end coupled to an inside of the hinge in a rotation axis perpendicular to the folding and unfolding axis to allow the folder to be folded and unfolded with respect to the main body, and automatically or manually rotating the folder with respect to the main body according to a user selection when the folder is in an open state.

27. The cellular phone of claim 26, wherein the rotation unit comprises:

a motor fixedly coupled to the folder; and

a rotation shaft controller disposed in the main body to be coupled to a shaft of the motor to control a rotation of the shaft.

28. The cellular phone of claim 27, wherein the rotation shaft controller comprises:

a male cam having one end coupled to the shaft of the motor and having the other end formed with a projection having tapered surfaces;

a female cam having a groove corresponding to the projection of the male cam to limit a movement of the male cam by a coupling state of the groove and the projection; and

an elastic member disposed below the female cam, having an elastic force which is greater than a driving force of the motor and less than an external force exerted on the folder to manually rotate the folder to elastically support the female cam with respect to the male cam and to selectively limit the movement of

the male and female cams.

29. A cellular phone providing wireless communication, comprising:

5 a main body having one of a key pad and a display, and having a hinge thereof along a folding and unfolding axis;

a folder having the other one of the key pad and the display, and coupled to the hinge to be folded and unfolded about the folding and unfolding axis with respect to the main body in a folding and unfolding direction perpendicular to the folding and unfolding axis;

10 a rotation unit having a first portion fixedly coupled to the folder along the folding and unfolding axis, a second portion fixedly coupled to the main body along the rotation axis, and a third portion coupled to transmit a driving force between the first portion and the second portion to rotate the folder in first and second directions about a rotation axis perpendicular to the folding and unfolding axis with respect to the main body.

20 30. The cellular phone of claim 29, wherein the rotation unit comprises:

a driving source disposed in the first portion of the folder, and having a shaft extended along the folding and unfolding axis to generate a driving force; and

25 a power transmission unit disposed in the third portion of the folder, and having one end coupled to the driving source and the other end coupled to the folder to transmit the driving force to folder to rotate with respect to the main body when the folder

is in an open state.

31. The cellular phone of claim 30, wherein the main body comprises a housing disposed in the second portion of the rotation unit, and the rotation unit further comprises:

a rotation controller disposed in the housing to be coupled to the power transmission unit and to control the third portion to automatically and/or manually rotate the folder with respect to the main body.